Atmos. Chem. Phys. Discuss., 15, C4342–C4344, 2015
www.atmos-chem-phys-discuss.net/15/C4342/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source attribution and process analysis for atmospheric mercury in East China simulated by CMAQ-Hg" *by* J. Zhu et al.

Anonymous Referee #3

Received and published: 4 July 2015

This is a nice study investigating source contribution and process analysis for atmospheric mercury in a mercury-polluted region using the CMAQ-Hg model with a nested technique. The findings of this study are useful for better understanding and identifying the key factors that significantly affect atmospheric mercury level and behaviour in East China. After the following comments are addressed, I recommend that the manuscript be accepted for publication.

General comments

1) Anthropogenic Hg emissions from countries around China are generally considerably large and apparently were not considered in this study (Fig. 1a). Those emissions could significantly affect atmospheric Hg level and behaviour in China. Thus they could

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significantly alter modelled results presented in this paper. The potential impact of neglecting those emissions should be discussed in the manuscript.

2) Elemental Hg demonstrates bi-directional mass exchange between air and surface. A bi-directional exchange model is ideal for accurately simulating dry deposition of element Hg. What kind of scheme/model was used to simulate dry deposition in this study? bi-directional or uni-directional? Are obviously different results expected by using a bi-directional exchange model? The manuscript should give a brief description about the dry deposition model used in the study.

3) GEOS-Chem model generally has much coarser spatial and temporal resolutions than CMAQ-Hg. What are the spatial and temporal resolutions of GEOS-Chem output that were used in this study? If they are coarser than those in CMAQ, how were the GEOS-Chem output processed and adapted to the resolutions employed in CMAQ-Hg simulations?

4) In section 3.2, the manuscript presents many numbers and points, but doesn't give sufficient and specific figure citations to support them. It is really difficult for readers to figure them out.

Technical comments

P10390 L5: "run with nested grid resolution of 27km" to "run with a nested domains" L10: "regard" to "regarded"

L13: "86.7" to "86.7%"

L24: "7.3" to "7.3 ngm-3"

P10391 L3: Majority of natural emission is element Hg which is chemically inactive. Why is it more significantly than anthropogenic emission to influence CHEM and AERO?

P10392 L27: "to simulate of regional" to "to simulate regional".

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P10393 L8: "with grid resolution of 27x27 km2" to "with a grid resolution of 27 km".

P10395 L16: "comprises" to "covers"

P10396 L7: "natural emissions (NAT) excluded", reword this sentence.

P10397 L15: What are time frames and monitoring frequencies of observations?

L24: What are specific unexpected complexity for emission and meteorological condition? why?

P10398 L13: PBM concentrations was significantly underestimated as well (by 60%). Why is less precipitation predicted the only reason that caused the underestimation?

P10403 L17: This sentence is confusing. Reword it.

L19: "a factor of >5 larger than" is confusing. Change it.

P10404 L8: It looks like EMIS and DDEP, instead of EMIS and VDIF, were also the dominant processes. Please check it.

L18: How are diurnal profiles calculated? Averaged all over non-urban grid cells for a year? A brief description should be added.

P10406 L2: "> 110% more" is confusing. Change it.

P10416 : label error in figure caption.

P10421 : add x axis title

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 10389, 2015.

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